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| 10/658,467 | 09/10/2003 | Shigeaki Ohmi | Q91042 | 2207 |

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| EXAMINER | |
|---|---|
| LAZORCIK, JASON L | |
| **ART UNIT** | **PAPER NUMBER** |
| 1731 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 01/11/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/658,467 | OHMI, SHIGEAKI | |
| | Examiner | Art Unit | |
| | Jason L. Lazorcik | 1731 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *07 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *9-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/30/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 9,10, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusumi (JP 02-038330) in view of Sharan (US 2002/0040885 A1) and Anthony et. al. (J.Vac.Sci.Techol. B 7(4) 1989, p621-626).

Specifically with respect to Claim 9, Kusumi (see Patent Abstract of Japan; Publication number: 02-038330) teaches a pressing mold having a molding surface of a silicon-containing (e.g. silicon carbide) base and a hard carbon film thereon. The reference indicates that press forming of a glass lens is carried out with said press mold which over time is inherently understood to wear, degrade, or deteriorate said molding surface and/or the carbon film.

Kusumi lays out a process of regenerating the carbon film on glass forming mold which has been deteriorated by multiple pressing operations. The first step in this regeneration involves removing the hard carbon film by an oxygen plasma ashing method. The second step involves applying a treatment with hydrogen fluoride or "a solution of an acid" to remove silicon oxide formed in the oxygen plasma ashing step on the mold surface. Finally a new hard carbon film is formed on the molding surface using a sputtering process or similar deposition process. While Kusumi indicates that the film should be etched with the plasma of a gas (e.g. oxygen), it fails to explicitly indicate that the plasma should contain hydrogen.

Sharan (US 2002/0040885 A1) teaches a process whereby carbon-containing material is plasma etched from a silicon-containing substrate. Sharan specifically indicates that "the plasma can predominately comprise hydrogen" and that "the plasma might also contain other reactive or inert gases, with Ar being but one example" (Pg 2, ¶[0025]). The immediate reference indicates that the plasma etching by the disclosed process "selectively removed the carbon containing polymer from the substrate relative to the otherwise exposed oxide and silicon materials" (Pg 2, ¶[0026]).

It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to substitute the oxygen plasma in the Kusumi process with the predominantly hydrogen plasma or "a plasma of a gas containing hydrogen" taught by Sharan. This modification would have been obvious to anyone seeking to enhance the selectivity of the carbon film etch rate over the silicon material etch rate, and thereby minimizing damage to the mold base material.

As correctly pointed out by applicant in the Office Action reply dated November 7, 2006, the processing temperatures taught in the hydrogen based plasma etching procedure are in the range of "at least 400°C". While the combined teachings of Kusumi and Sharan fail to expressly delineate the claimed process range of "a base plate temperature from room temperature to 300°C" as set forth in the instant application claim 9, lines 4-5, one of ordinary skill in the art at the time of the invention would reasonably have been apprised of the analogous art teachings set forth by Anthony. The instant reference teaches a method for the removal of carbon deposits from silicon based substrates by a hydrogen plasma treatment. Specifically, Anthony teaches that "A variety of hydrogen in situ cleaning parameters have been utilized. These include hydrogen partial pressures (3 and 45 m Torr), rf powers (10-70W) **and substrate temperatures during cleaning (150-325°C)**." (pg 623, ¶2). An examination of the reference Figure 2 Auger spectra clearly displays the removal of carbon contamination from the silicon substate by the disclosed process. With the Anthony disclosure in hand, it would have been obvious to one of ordinary skill in the art at the time of the invention seeking to remove a carbon film from a silicon substrate by hydrogen plasma to perform said operation in the temperature range between 150-325°C as taught by Anthony which directly reads upon "a base plate temperature from room temperature to 300°C" as claimed by Applicant. The Anthony teachings would have been an obvious modification to the Kusumi/Sharan process for anyone seeking to minimize the thermal strain placed upon the substrate during the cleaning operation .

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Kusumi (JP 02-038330), Sharan (US 2002/0040885 A1), and Anthony as applied to Claim 9 above, and further in view of Bernhardt et. al. (Applied Physics Letters 74(8), 1999, pg 1084-1086) and Neudeck (Encyclopedia of Materials: Science and Technology, 2001, pp.8508-8519).

According to the applicant, the plasma oxidation using oxygen plasma by the Kusumi process erodes the base material of the molding surface to yield an oxide or silicon oxide layer (Pg 2, lines 19-22). Kusumi teaches (see Abstract JP 02-038330) that this silicon oxide layer is removed after said oxygen plasma treatment by a treatment with an aqueous solution of hydrogen fluoride or a salt thereof to expose the silicon carbide base material of the molding surface. The applicant continues by asserting that "this removal slightly roughens the surface of the base material" and "with repeated regeneration of the pressing mold, this surface roughening accumulates" (Pg 2, lines 26-29).

As indicated above in the rejection of Claim 9, Sharan teaches that a highly selective etch of carbon over silicon materials is achieved by using a plasma which predominantly comprises hydrogen. Further, Bernhardt indicates that preparation of silicon carbide surfaces by hydrogen plasma produces highly ordered ***monolayer*** of silicon dioxide. The Bernhardt monolayer is distinguished from the Kusumi "erosion" of the SiC base layer which forms a silicon oxide layer in that the Bernhardt monolayer is by definition only a few atoms to a single molecule thick (~1-2 nanometer) and in the immediate context considered to be of negligible thickness. Finally, Neudeck (pg 6,

§4.3, lines 1-2) indicates that "at room temperature, no know wet chemical etches single-crystal SiC". Since the hydrogen fluoride treatment taught by Kusumi and the claimed "solution of an acid or an alkali" are understood to be wet chemicals at room temperature, neither are considered to be etchants for SiC at room temperature under the Neudeck disclosure.

Therefore, since the silicon oxide layer formed on the SiC base mold by the Kusumi-Sharan-Anthony hydrogen plasma is of negligible thickness and hydrogen fluoride does not etch SiC at room temperature, dissolution of said silicon oxide layer by a hydrogen fluoride treatment is understood to inherently cause negligible surface roughening. This is understood to be the case regardless of the chosen order of the cleansing step in the larger process (eg. before or after removal of the carbon film).

The Kusumi-Sharan-Anthony process lays out an ordered set of steps wherein the molding surface is cleansed with a solution of an acid (hydrogen fluoride) after removing of the carbon film. As recited, the Kusumi-Sharan-Anthony process fails to explicitly indicate that the molding surface should be cleansed with said solution prior to removing the carbon film from the molding surface. In light of the argument set forth above and in the absence of new or unexpected results, the Kusumi-Sharan-Anthony process outlined in the rejection of Claim 9 is held to render prima facie obvious the immediate claim directed to reversing the order of the cleansing step. See In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946) (Selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results).

Claim 12, 13, 14, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusumi (JP 02-038330) in view of Drzal (US 6,551,407) and the teaching reference of Vig (J.Vac. Sci.Technol. A 3 (3), 1985, p1027-1034) .

Specifically with respect to Claim 12, Kusumi (see Patent Abstract of Japan; Publication number: 02-038330) teaches a pressing mold having a molding surface of a silicon-containing base and a hard carbon film thereon. The reference indicates that press forming of a glass lens is carried out with said press mold which over time is inherently understood to degrade or deteriorate said molding surface and/or the carbon film.

Kusumi lays out a process of regenerating the carbon film on glass forming mold which has been deteriorated by pressing by first removing the hard carbon film by oxygen plasma ashing method. Applying a subsequent treatment with hydrogen fluoride or "a solution of an acid" to remove silicon oxide which has a weak adhesive force to the hard carbon film. Finally a new hard carbon film is formed on the molding surface using a sputtering process or similar deposition process. Kusumi fails to explicitly indicate that the deteriorated film should be removed by a treatment with ozone.

Drzal teaches a method for treating the substrates of molds to remove or mold release agents using continuous ultraviolet light and ozone (Column 1, Lines18-20). The immediate reference indicates that the UV Ozone process is rapid and economical (Column 2, lines 52-54) and preferably a continuous process (Column5, Line 34).

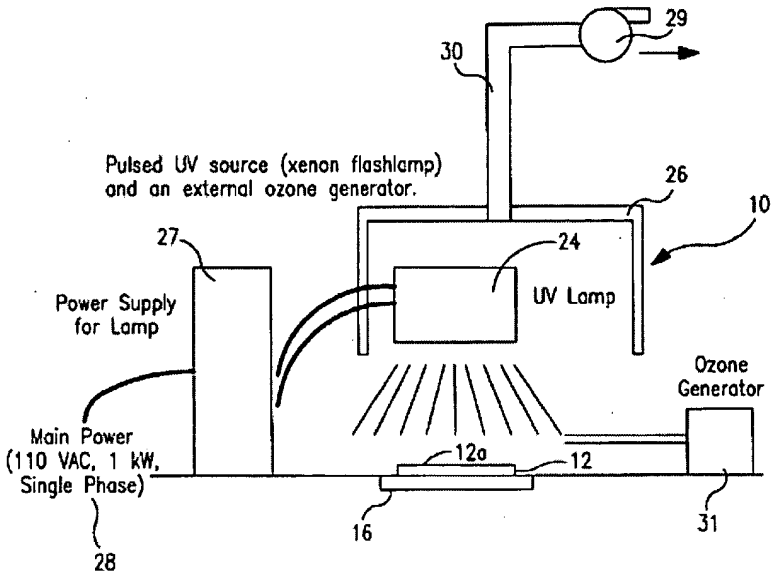


FIG. 1

Drzal indicates that " An external ozone generator (31) was used to increase the concentration of ozone over the substrate (12) surface ***over what is generated in air by the UV light***" (Column 7, Lines 50-52). It would have therefore been obvious to one of ordinary skill in the art at the time of the invention to modify the Kusumi process by substituting the oxygen plasma cleansing step with the UV ozone process as taught by Drzal. Vig teaches that the UV/Ozone cleaning process effectively removes a range of hydrocarbons (page 1029, column 1 line 18 to Column 2, Line 16) as well as "films of carbon". The Drzal UV/Ozone technique would have been an obvious addition to the Kusumi process for one seeking to optimize the economy and speed carbon or hydrocarbon film removal by making said process continuous.

Claim 13 is oblivious in light of the rejection of Claim 12 above.

Regarding Claim 14 and in light of the rejection of claim 13 above, Drzal indicates that " the infrared wavelength portion of the radiation combined with focusing optics of the lamp can cause large, local, increases in surface temperature" (Column 7, Lines 21-28). Further, the immediate reference figures 9 to 12 indicate process temperatures between 100°C to 600°C as claimed.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kusumi (JP 02-038330), Drzal (US 6,551,407), and Vig as applied to Claim 12 above, and further in view of King et. al. (Journal of the Electrochemical Society: 146(7) 2648-2651 (1999) and Neudeck (Encyclopedia of Materials: Science and Technology, 2001, pp.8508-8519).

According to the applicant, the plasma oxidation using oxygen plasma by the Kusumi process erodes the base material of the molding surface to yield an oxide or silicon oxide layer (Pg 2, lines 19-22). Kusumi teaches (see Abstract JP 02-038330) that this silicon oxide layer is removed after said oxygen plasma treatment by a treatment with an aqueous solution of hydrogen fluoride or a salt thereof to expose the silicon carbide base material of the molding surface. The applicant continues by asserting that "this removal slightly roughens the surface of the base material" and "with repeated regeneration of the pressing mold, this surface roughening accumulates" (Pg 2, lines 26-29).

As indicated above in the rejection of Claim 12, Drzal indicates that UV produced ozone provides an effective and cost efficient method for removing a carbon film from a silicon carbide mold base. Further, King teaches (pg 2650, Column 2, ¶ 2) that $UV/O_3$

grows a thin (10-20 angstrom) passivating oxide on a silicon carbide surface. As discussed in the rejection of claim 11 above, a 1 to 2 nanometer silicon oxide layer is considered in the instant case to be of negligible thickness. Finally, Neudeck (pg 6, §4.3, lines 1-2) indicates that "at room temperature, no know wet chemical etches single-crystal SiC". Since the hydrogen fluoride treatment taught by Kusumi and the claimed "solution of an acid or an alkali" are understood to be wet chemicals at room temperature, neither are considered to be etchants for SiC at room temperature under the Neudeck disclosure.

Therefore, since the silicon oxide layer formed on the SiC base mold by the Kusumi-Drzal-Vig UV/$O_3$ process is of negligible thickness and hydrogen fluoride does not etch SiC at room temperature, dissolution of said silicon oxide layer by a hydrogen fluoride treatment is understood to inherently cause negligible surface roughening. This is understood to be the case regardless of the chosen order of the cleansing step in the larger process (eg. before or after removal of the carbon film).

The Kusumi-Drzal-Vig process lays out an ordered set of steps wherein the molding surface is cleansed with a solution of an acid (hydrogen fluoride) after removing of the carbon film. As recited, the Kusumi-Drzal-Vig process fails to explicitly indicate that the molding surface should be cleansed with said solution prior to removing the carbon film from the molding surface. In light of the argument set forth above and in the absence of new or unexpected results, the Kusumi-Drzal-Vig process outlined in the rejection of Claim 12 is held to render prima facie obvious the immediate claim directed to reversing the order of the cleansing step. See In re Burhans, 154 F.2d 690, 69 USPQ

330 (CCPA 1946) (Selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results).

Claims 16, 17, 18, 23, 24 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusumi-Sharan-Anthony as applied to claim 9 above, and further in view of Hirota (US 6,560,994 B1). Kusumi-Sharan-Anthony fails to explicitly set forth the processing steps wherein a pressing mold having a carbon film on the molding surface is operated by;

Press molding a heat-softened glass material with the press mold,

cooling the press molded glass material in the pressing mold, and

taking out the press molded glass material from the pressing mold.

Hirota (Column 12, Lines 40-53) explicitly sets forth this set of common operating procedures. It would have been obvious to one of ordinary skill in the art at the time of the invention utilizing the press mold described by Kusumi to follow the set of the common processing steps explicitly set forth by Hirota in the manufacture of a molded glass article.

Claim 17 is obvious in light of the rejections of Claim 16 and Claim 9 above.

Claim 18 is obvious in light of the rejection of Claim 16 and the argument set forth in the rejection of Claim 11 above.

Claim 23 is obvious in light of the rejection of Claim 16 and the disclosure by Hirota (Column 11, Lines 2-6) wherein Hirota indicates that "The molding surfaces are finished with a high shape precision and ground, and then slightly polished to be finished to a mirror surface of surface roughness Rmax of 50 angstroms or less." While

Kusumi-Sharan (Patent Abstract JP 02-038330) fails to specifically limit the surface roughness of the molding surface, Hirota indicates that a precision molding surface of the type routinely encountered in the art presents an Rmax of 50 angstroms or less which is understood as less than the claimed 20 nm. It would have therefore been obvious to one of ordinary skill seeking to practice a precision molding operation of glass articles by the Kusumi-Sharan process to utilize a highly polished surface as taught by Hirota in order to insure a high surface quality in the molded product.

Claim 24 is obvious in light of the rejection of Claim 16 and the disclosure by Hirota (Column 11, Lines 19-20) wherein Hirota indicates that a "barium borosilicate glass" or borate glass is utilized in the press molding operation. Kusumi-Sharan-Anthony (Patent Abstract JP 02-038330) fails to explicitly indicate a preferred glass stock to be utilized in the press molding operation. It would have been obvious to one of ordinary skill to choose said glass stock from among the commonly utilized and routine glass stock materials including phosphate glass, fluorophosphates glass and borate glass as taught by Hirota.

Claims 19 through 22, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusumi-Drzal-Vig as applied to claim 12 above, and further in view of Hirota (US 6,560,994 B1). Kusumi-Drzal-Vig fails to explicitly set forth the processing steps wherein a pressing mold having a carbon film on the molding surface is operated by;

Press molding a heat-softened glass material with the press mold,

cooling the press molded glass material in the pressing mold, and

taking out the press molded glass material from the pressing mold.

Hirota (Column 12, Lines 40-53) explicitly sets forth this set of common operating procedures. It would have been obvious to one of ordinary skill in the art at the time of the invention utilizing the press mold described by Kusumi to follow the set of the common processing steps explicitly set forth by Hirota in the manufacture of a molded glass article.

Claim 20 is obvious in light of the rejections of Claim 19 and Claim 12 above.

Claim 21 is obvious in light of the rejections of Claim 19 and Claim 14 above.

Claim 22 is obvious in light of the rejections of Claim 19 and the argument set forth in the rejection of Claim 15 above.

***Response to Arguments***

With respect to claims 9-11, Applicant has argued that one of ordinary skill in the art would not have found reasonable motivation to combine the Kusumi and Sharan teachings as set forth by the Examiner in the previous Office Action. Both of said references teach the use of a plasma "etching" or cleaning techniques to remove deposits from surfaces. Although the substrates in each reference are different as pointed out by the applicant, said teachings are related on a technically fundamental level. Therefore as indicated in the above rejection under 35 USC 103(a) and in the prior Office Action, one of ordinary skill in the art would have had ample motivation to combine the teachings of Kusumi with the analogous teachings of Sharan.

Applicants arguments regarding the processing temperature range in Claim 9 are found moot in view of the new grounds of rejection as presented above under 35 USC 103(a).

With respect to Claims 12-24, applicant argues that one of ordinary skill in the art would not have been motivated to look to the teachings of Drzal to modify the Kusumi process. By the same rationale used above, both Drzal and Kusumi are concerned with the removal of a relatively thin surface film from a substrate. As further set forth in the new rejection above under 35 USC 103(a), Vig teaches that UV/Ozone is known to be an effective etch technique for carbon films in addition to hydrocarbon films. For at least these reasons, one of ordinary skill in the art at the time of the invention would have found motivation to combine the indicated teachings.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Donnelly et. al. (Plasma Chemistry and Plasma processing, Vol. 1, No. 4, 1981) teaches that "Temperature influences rate, selectivity, surface morphology, and the degree on anisotropy" (pg 321, lines16-18).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason L. Lazorcik whose telephone number is (571) 272-8153. The examiner can normally be reached on Monday through Friday 8:30 am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JLL

ERIC HUG
PRIMARY EXAMINER